UNIQUE CONCEPT 'OR A LOW COST, LIGHT WEIGHT SPACE DEPLOYABLE ANTENNA STRUCTURE

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Large space deployable antennas are needed for a variety of applications that include Mobile Communications, Radiometry, Active Microwave Sensing, Very Long Baseline Interferometry and DoD Space Based Radar. These user requirements identify the need for structures up to tens of meters in size for operation from 1 to 90 GHz, based on different aperture configurations. However, the one thing the users have in common is a concept selection criteria for low cost, light weight and highly reliable deployable structures. Fortunate y, a unique class of space structures has recently emerged that have tremendous potent ial for satisfying these criteria. They are referred to as inflatable deployable structures. A good example of such a concept is under development at L'GARDE, INC. of Tustin, California.

Serious interest from the user community will only result from demonstrations of antenna functional performance in realistic environments. The L'GARDE INC. concept utilizes very low inflation pressures to maintain the required shape of the reflector structure on orbit. Consequently, this approach results in a structure that will not support itself in a functional configuration in a one g environment. The gravity induced deflections of the antenna structure will preclude any meaningful ground based demonstrations of functional performance such as deployment, reflector surface precision or validation of analytical performance prediction models. Consequently, this class of space structures must be validated and characterized by flight experiments. Such ground based test limitations are the justification for an In Space Technology Experiment (IN-STEP) Inflatable Antenna Experiment using the L'GARDE inflatable antenna structural concept. The experiment objectives are to validate and characterize the mechanical functional performance of a 14 meter diameter inflatable deployable reflector antenna structure in the relevant operational environment. The experiment will utilize the Spartan spacecraft, which is launched, deployed and recovered by the S"1'S. The Spartan will provide mounting, attitude control, power and data recording for the antenna experiment.

Results of this experiment will verify the fabrication of a large size space structure for only a few million dollars, demonstrate the reliability of deployment, characterize the quality of the reflector surface and correlate the analytical performance prediction models with actual measured characteristics. Other technology developments, in support of the experiment, at NASA Langley Research Center, include the development of new and advanced flexible materials and system studies that assess the adequacy of this structural concept for specific classes of applications, These technology results will be used collectively to advance the technology of the concept with respect to improving surface precision, performance prediction capability and accommodating larger size structures with different configurations in different orbits,

Technology transfer from the experiment to the antenna concept development activity will effectively be accomplished, since 1,' GARDE is the principal investigator for the experiment. JPL, as the project manager, will see that the user community is kept aware of the technological advances of the basic inflatable concept.

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U. SYMPOSIUM ON SPACE SYSTEMS
(6 sessions)

The overall theme of the symposium is the role of (advanced) technologies and designs in affordable space systems. It covers the development, validation and application of such technologies design applied to the various areas of space exploration and exploitation.

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Session 1: TECHNOLOGY VALIDATION

Reduction in the cost of space missions can often he gained by the application of advanced technologies. Yet project managers are reluctant to incorporate new components if they have not been validated in the relevant environment. Papers in (his session will discuss technology transfer to flight projects by in-space or ground based testbed validation/demonstration and the relative merits of these methods.

PAPER IN THIS SESSION!

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